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THE

NATIONAL GEOGRAPHIC SOCIETY

SPECIAL ANNOUNCEMENT

To fill the vacancy in the presidency caused by the lamented death of Mr Gardiner G. Hubbard, General A. W. Greely, U. S. A., has been designated by the Board of Managers as Acting-President. At some personal inconvenience General Greely has acceded to the request of the Board, but has intimated that his official and other duties will render it impossible for him to serve the Society in this capacity for more than a short time.

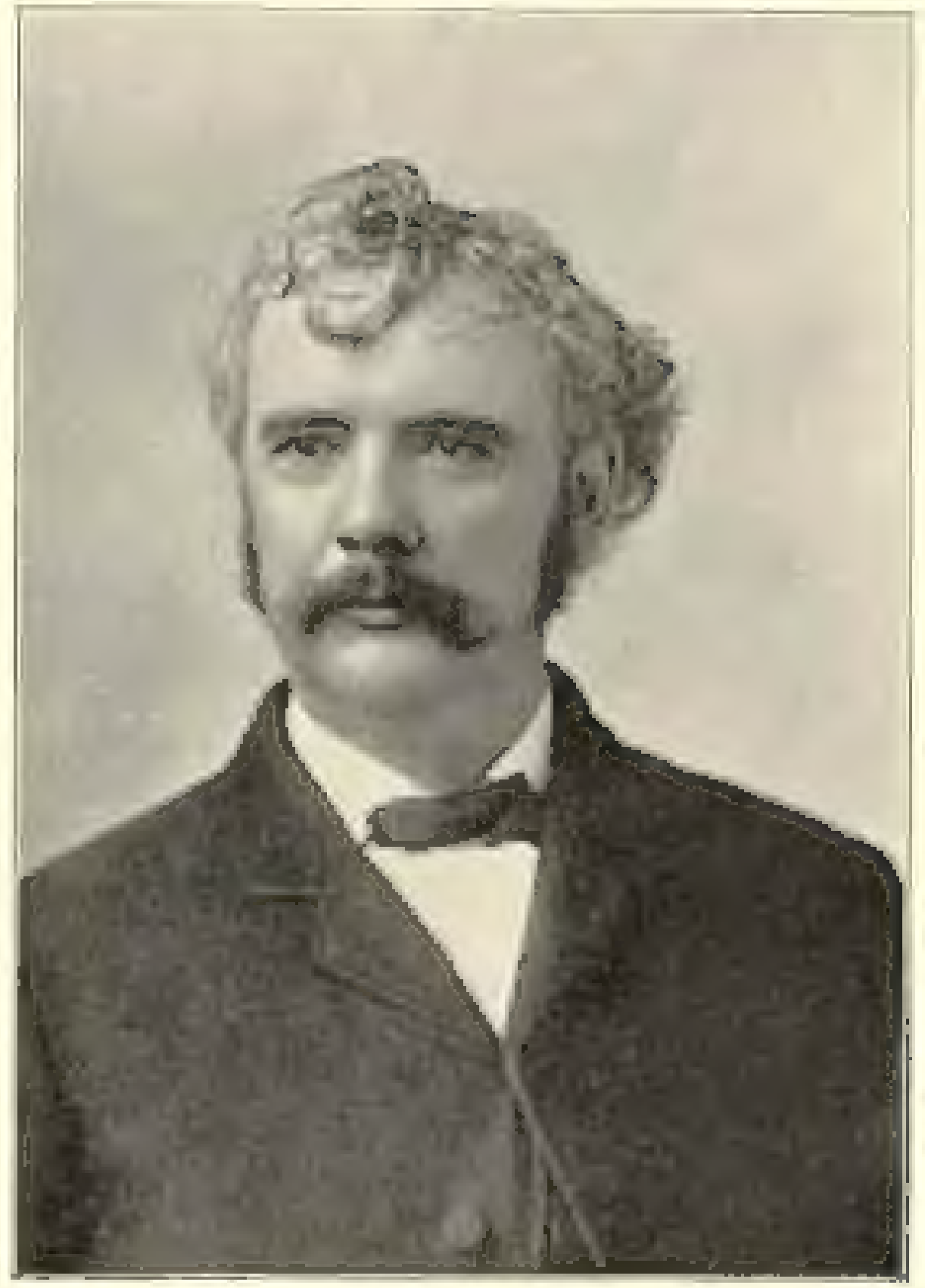
The Board of Managers have accepted the resignation of Mr Everett Hayden as Recording Secretary, Mr Hayden still remaining a member of the Board. To fill this vacancy Mr F. H. Newell, a former secretary, has been designated, it being the intention of the Board to employ as Assistant Secretary some person who is qualified not only to perform the clerical duties of the position, but also to relieve the editors of the Magazine by acting as business manager of that publication.

The Society's office has been removed to Room 55, Ohio National Bank Building, on the northwest corner of Twelfth and G Streets N. W. In these more commodious quarters it is expected to so arrange the Society's Library as to make it available to visiting members and their friends. The transaction of business will be facilitated by the addressing of mail to the undersigned at the above address.

F. H. NEWELL,
Secretary

SIR JOHN EVANS

President of the British Association for the Advancement of Science



PROF. W. J. McGEE

Acting-President of the American Association for the Advancement of Science

THE

National Geographic Magazine

Vol. VIII DECEMBER, 1897 No. 12

THE WASHINGTON AQUEDUCT AND CABIN JOHN BRIDGE*

By D. D. Gaillard,

Captain, Corps of Engineers, U. S. Army

The idea of supplying the city of Washington with water at some day was contemporaneous with the planning of the city, and numerous examinations and surveys were made by Major L'Enfant, the engineer and architect of the Government, under the direction of General Washington, of the Potomac river, the Eastern branch, Rock creek, and numerous springs and small streams, as possible sources of future supply.

The first definite plan to be found among the records of the Washington Aqueduct Office is given in a report made in January, 1851, by Brevet Lieut. Col. George W. Hughes, Corps of Topographical Engineers, to Colonel J. J. Abert, Chief of Topographical Engineers, in compliance with an act of Congress, approved September 30, 1850, appropriating $500 "to enable the War Department to make such examinations and surveys as may be necessary to determine the best and most available mode of supplying the city of Washington with pure water and to prepare a plan and estimate of the probable cost of the same, to be reported to Congress at its next session."

After an investigation of the subject Colonel Hughes proposed to obtain the necessary supply from Rock creek by damming the stream about six miles above the city and bringing the water into a receiving reservoir through a conduit of oval cross-section having an estimated capacity of 8,000,000 gallons in 24 hours.

* Read before the National Geographic Society, October 2, 1897.

It is interesting at this point to compare the estimate of the supply needed for the city in 1851 with that actually furnished in 1897—but 46 years later. The population of Washington and Georgetown was then about 48,000; now it is over 278,000; then 30 gallons was considered by Colonel Hughes a high estimate for the average daily per capita consumption; during the past month the average daily consumption for every inhabitant of the District of Columbia was 173 gallons; then the total estimated maximum consumption of water was 1,500,000 gallons per day; during the past month it actually exceeded 48,000,000 gallons per day.

No action appears to have been taken by Congress toward carrying out the plan proposed by Colonel Hughes, and the next step was one which eventually resulted in the construction of the present aqueduct system. The 32d Congress at its first session appropriated $5,000 to enable the President of the United States to cause to be made the necessary surveys, projects, and estimates for determining the best manner "of affording to the cities of Washington and Georgetown an unfailing and abundant supply of good and wholesome water." In accordance with this legislation the necessary surveys were made in the winter of 1852–53 by Lieutenant (afterward General) Montgomery C. Meigs, U. S. Corps of Engineers, who, in his report of February 12, 1853, proposed three plans for obtaining the necessary water supply, submitted estimates of the cost of each, and entered into a broad and far-sighted discussion of the subject of supplying the cities with water.

In urging the necessity of a suitable supply he states that it was the general custom in Washington at that time to have all "the water for a family brought by the servant-maids from the street pump," a crude condition of affairs which the average Washingtonian of today will find it hard to believe existed but a little more than 40 years ago.

Briefly summed up, the three sources of supply proposed by General Meigs were as follows: (1) From Rock creek, by means of a dam and a conduit under natural flow. Estimated minimum daily supply, 9,860,000 gallons; estimated cost, $1,258,863. (2) From the Potomac at Little Falls, six miles above Georgetown, by means of a dam across the river, a canal and pumping machinery to raise the water to the reservoirs. Estimated minimum daily supply, 12,000,000 gallons; estimated cost, $1,662,215. (3) From the Potomac, just above the Great Falls, by means of

a dam, a masonry conduit, two reservoirs, and the necessary bridges. Estimated daily supply, 36,015,400 gallons; estimated cost, $1,921,244.

This last estimate was based upon a conduit of seven feet in diameter and a bridge of a different design from that finally built over Cabin John creek. General Meigs recommended an increase in the diameter of the conduit to nine feet, which, with the changed plan of the bridge just mentioned, made the final estimated cost about $2,435,000 and increased the estimated capacity of the conduit to 67,500,400 gallons, a most fortunate change for the citizens of the District of Columbia, for had the seven-foot conduit been built, the limit of its capacity would have been reached about six years ago.

In his report General Meigs urged the adoption of the third plan, calling attention to the fact that the waterworks of this country had been almost invariably designed on an inadequate scale, and that the history of all these works showed that the daily per capita consumption of water was increasing at a rate comparatively rapid. In consequence of this fact and of the rapid growth of population, many of these earlier works proved insufficient within a few years after construction.

Too much praise, then, cannot be given to the man who in 1853 planned a conduit with an ultimate daily capacity equal to one and one-half times the amount then furnished to the city of London, nearly four times that furnished to Paris, two and one-half times that furnished to New York, five times that furnished to Philadelphia, and one and one-half times that then furnished to Rome, although in A. D. 100 Rome had a daily supply of 277,000,000 gallons. Be it remembered that General Meigs did this when the combined population of Washington and Georgetown was but 58,000, which it was estimated would then require for all public and domestic purposes a total supply of but 5,220,000 gallons, about one-fifteenth of the ultimate capacity of the conduit.

General Meigs' recommendation of the enlarged Great Falls plan and his reasons therefor carried such weight that they received the strong indorsement of General Joseph G. Totten, Chief of Engineers, when he forwarded the report to the Hon. C. M. Conrad, Secretary of War, who submitted it to President Fillmore without comment.

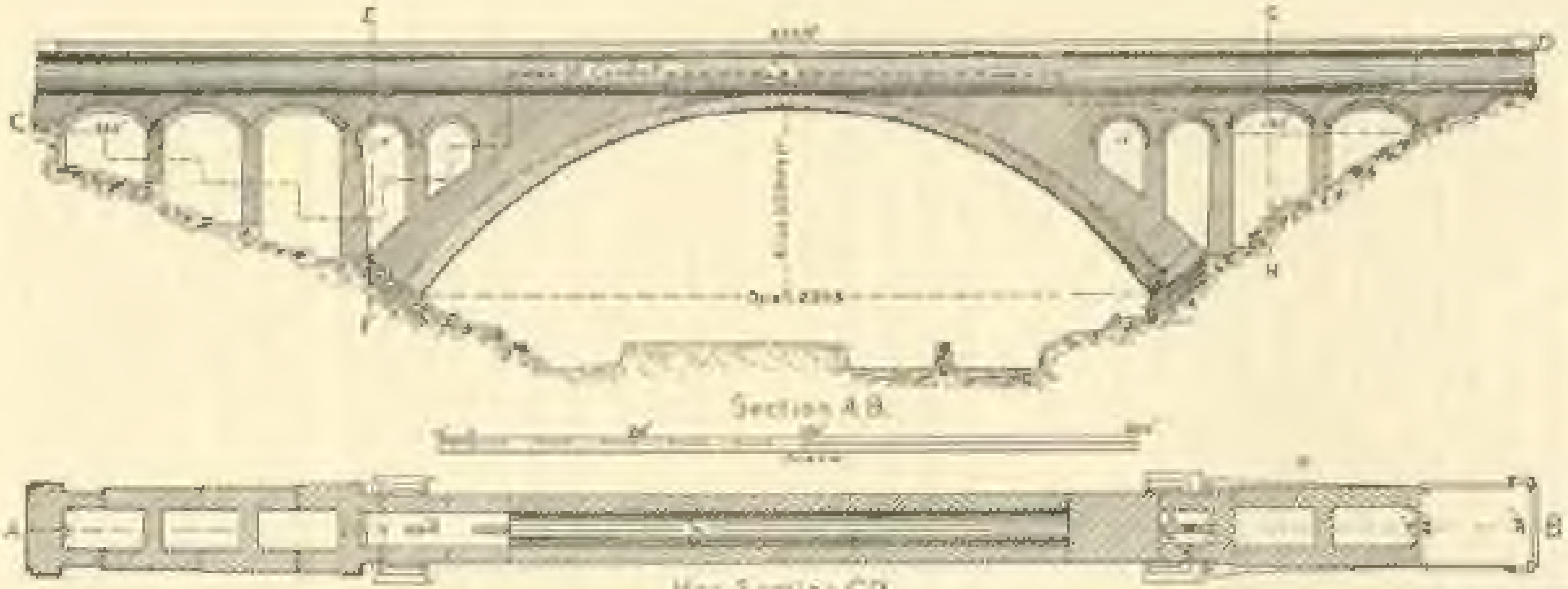
The first appropriation for the construction of the aqueduct was made in March, 1853, and the actual work of breaking ground

was commenced in November, 1853. In order that the city might receive a supply of water as soon as possible, work was pushed upon the receiving (Dalecarlia) reservoir and the conduit connecting it with the supply mains, and on January 3, 1859, water from the Dalecarlia reservoir was introduced into the pipes leading to the city. This was not Potomac water, however, but was supplied by the streams emptying into the Dalecarlia reservoir, which streams are now diverted therefrom by the admirable system of protection works completed in 1895 by Colonel George H. Elliot, U. S. Corps of Engineers, retired. This mode of supply continued until the conduit between Great Falls and the Dalecarlia reservoir was completed, in 1863, and on December 5, 1863, Potomac water was introduced into the Dalecarlia reservoir for the first time.

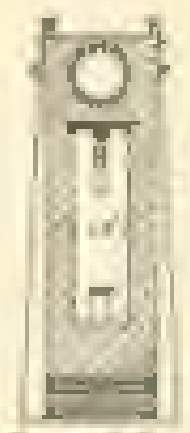
Conn's island separates the Potomac at Great Falls into two parts, known as the Maryland and Virginia channels respectively. In order to divert water into the mouth of the conduit-feeder at Great Falls a temporary dam of stone and crib work was built across the Maryland channel, 1857 to 1864, which was replaced by a masonry dam completed in 1867. In 1883–86 the masonry dam was extended across the Virginia channel. In times of very low water in the Potomac this dam, the crest of which was at an elevation of 148 feet above mean tide at the Washington navy yard, did not raise the water to a height sufficient to fill the mouth of the conduit at Great Falls, and in 1875–76 the whole dam was raised 2½ feet, so that at low stages of the Potomac the mouth of the conduit is just filled.

The Washington aqueduct system as it exists today is, with but few modifications, that originally planned by General Meigs. The water supply is taken from the Potomac river at Great Falls, about 14 miles above the city. At this point a masonry dam eight feet in width on the top and 2,577 feet in length, completed in 1860, extends across the river from the Maryland to the Virginia shore. The water passes from the feeder, under the Chesapeake and Ohio canal, through the gatehouse and into the conduit, which is circular in cross-section, and for the greater part of its entire length is nine feet in diameter and composed either of rubble masonry plastered or of three rings of brick, but where the soil in which it was built was considered particularly good the inner ring of brick was omitted and the diameter was nine feet nine inches. Where the conduit passes as an unlined tunnel through rock the excavation was sufficient to contain an inscribed circle 11 feet in diameter.

Cabin John Bridge.



Construction commenced 1857.
Construction completed 1864.
Parapet walls constructed 1873-73.
Dark brown arch = Quincy granite.
Light arch = Seneca sandstone.
Spandrils = Seneca sandstone.
Parapet walls = Seneca sandstone.
Abutments = Granite from Montgomery Co., Md.



Location.	Number of Arches.	Span in Feet.	Width in Clear.
West Abutment			
East Abutment			
Spandrils Arches			
Wing Arches			
Total			
Springing Line			
Parapet Walls			
Combined Towpath Bridges			
TOTAL			

AQUEDUCT BRIDGE OVER CABIN JOHN CREEK, NEAR WASHINGTON, D. C.

The total length of the conduit and the two by-conduits around the reservoirs is 12 miles, and its slope is nine inches in 5,000 feet. Constructed by General Meigs in connection with the aqueduct system are five bridges, two of which are unique among engineering structures and will be briefly described later.

At the distributing reservoir the water passes into four cast-iron mains—48 inches, 36 inches, 30 inches, and 12 inches in diameter respectively. The Dalecarlia reservoir has a storage capacity of about 150,000,000 gallons, is practically without paved slope walls, and is perfectly protected against pollution from the drainage of the surrounding country. The distributing reservoir has a storage capacity of about 150,500,000 gallons and is divided by a puddled and paved wall (through which is a passageway) into two sections containing 97,000,000 and 53,250,000 gallons respectively. The Georgetown high-service reservoir has a capacity of about 1,500,000 gallons.

In addition to the three reservoirs already mentioned, which form a part of the aqueduct system, there is another reservoir, built and controlled by the Commissioners of the District of Columbia, called the Fort Reno reservoir, with a capacity of about 4,500,000 gallons, the reference of its water surface when the reservoir is full being about 420 feet above mean tide at the navy yard.

The Dalecarlia and distributing reservoirs supply the pumping station and that part of the District which lies below 100 feet above datum. The areas lying between the levels of 100 and 210 feet above datum are supplied by pumping from the U-street station directly into the distributing mains, the Georgetown high-service reservoir being held as a reserve supply. The areas having a greater elevation than 210 feet above datum are supplied from the Fort Reno reservoir. It will be observed, therefore, that the total present storage capacity of all reservoirs is a little less than 300,000,000 gallons, or about six days' supply.

In July, 1897, for the first time in its history the conduit was permitted to discharge its maximum flow, which by current meter observations was found to be 70,500,000 gallons per 24 hours. Today the average daily consumption is about 45,000,000 gallons, or about 60 per cent of the ultimate capacity of the conduit. Ten years ago it was but 35 per cent, or less than 27,000,000 gallons.

To avoid misapprehension it should be stated that while the conduit can supply the distributing reservoir with 70,500,000 gallons per day, yet the pipes leading from the reservoir to the

[illegible] will be felt by consumers [illegible]

from the existing reservoir [illegible]

[illegible] Meigs was in charge of the work upon the Washington [illegible] conduct from the time of the first survey in July 1853, when it was started by Captain M. W. Buell, of the Corps of Engineers, [illegible] was succeeded by Lieutenant James [illegible], Meigs [illegible] On February 23, 1861, after an abortive attempt of the Washington aqueduct was transferred from [illegible]

April 1861, when [illegible] joined into the new Army of the Potomac, and has remained to [illegible]

In this report upon the proposed line of the conduit, General Meigs writes that seven miles after leaving Great Falls the only serious obstacle [illegible] Cabin John [illegible] and natural. [illegible] however, be easily [illegible]

long as "they always command a long line [illegible] the [illegible] but the [illegible] they replace." He therefore first proposed to [illegible] by an [illegible] feet long and 90 feet [illegible]

[illegible] feet. The estimated cost of this [illegible] was $[illegible]

[illegible] structure, the granite stone arch [illegible], was erected.

The total length of the bridge, including abutments, is 220 feet 10 inches; its width is 21 feet 4 inches, and the height of the arch is 57 feet 6 inches. The piers are 8 feet 6 inches thick at the springing line, and the abutments are 10 feet 6 inches. The arch stones are [illegible] inches wide on the intrados and [illegible] inches on the extrados, and the [illegible] of the spandrel walls is 2 feet 6 inches. The bridge was constructed

bridge prior to that time by [illegible] granite. At the original

[illegible]

cubic yards of stone masonry [illegible], and brickwork, and it was completed [illegible] The cost of the [illegible]

(Museum). Its [illegible] granite from the [illegible] of Montgomery county [illegible] piers, and the rubble arch, spandrels, and parapet are of Seneca sandstone.

Contrary to the general impression, the space between the spandrel and abutment walls is not solid, but contains several arches, as shown in the drawing, to effect a saving in masonry. Materials were transported to the bridge by boat on the Chesapeake and Ohio canal and Cabin John creek, across which a dam was built near the mouth, and the pool thus formed was connected with the latter by a lock.

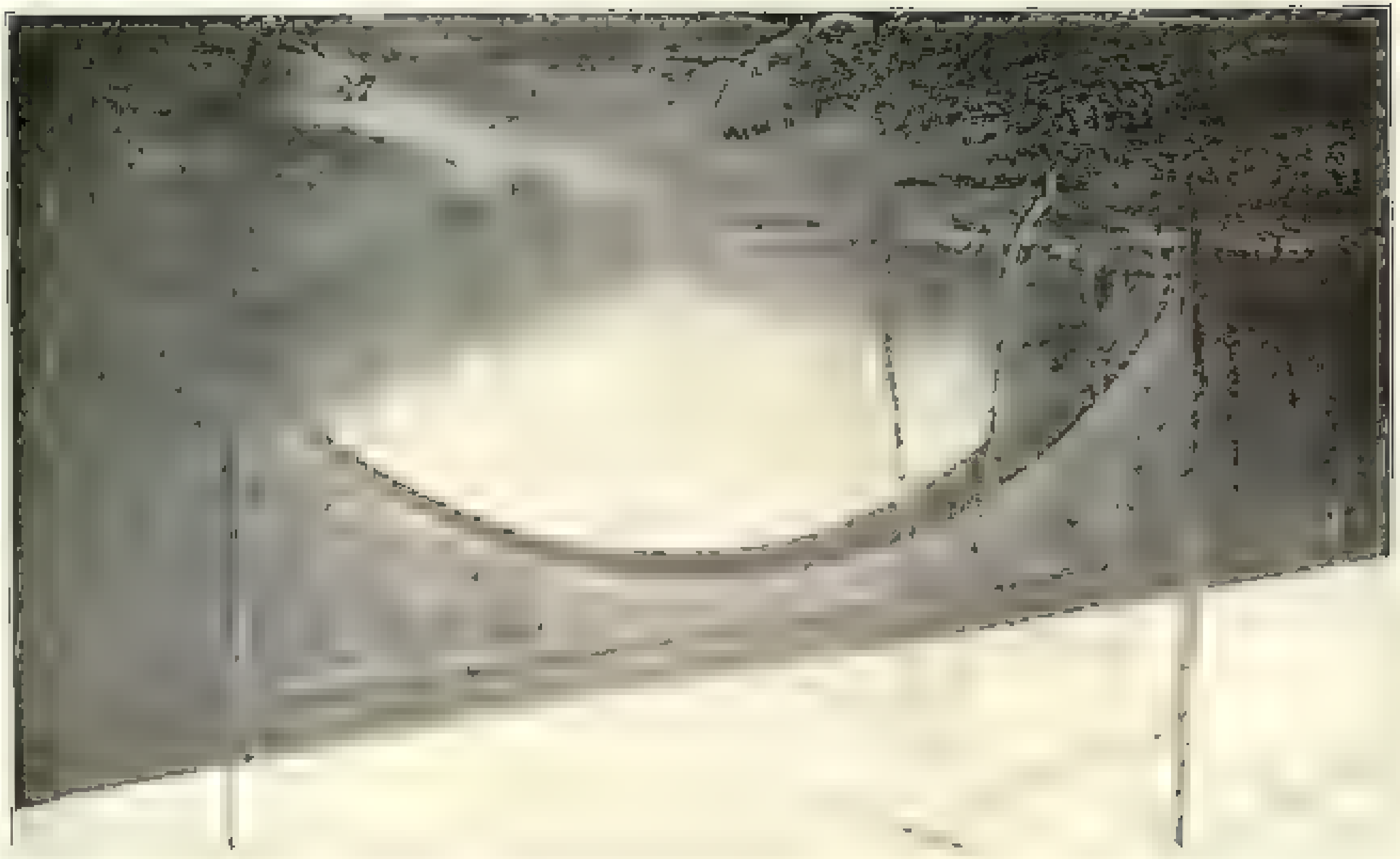
On the [illegible] of the west abutment of the bridge is the following inscription:

Washington Aqueduct.
Begun A. D. 1853. President of the U. S.
Franklin Pierce. Secretary of War
[illegible] Building A. D. 1861
President of the U. S., Abraham Lincoln.
Secretary of War Simon Cameron.

This inscription is [illegible] of the name of Jefferson Davis, which was cut out in the summer of 1862 by the contractor by order of the Secretary of the Interior, Hon. Caleb B. Smith, to whose department the aqueduct had been recently transferred. If forgetfulness of the [illegible] historical fact that [illegible] was Secretary of War at the time was the object sought by the measure, the [illegible] has [illegible] failed, for the [illegible] attempts [illegible] to [illegible] the [illegible] is more [illegible] impressed upon the memory of the visitor than would have been the case had it remained [illegible].

In concluding the description of the Washington aqueduct and its appurtenant structures it is proper to call attention to another of its bridges, the one over Rock creek on Pennsylvania avenue, [illegible] for its [illegible] originality by [illegible] bridge for [illegible] general [illegible].

This bridge is unique among the aqueduct bridges of the world, in that the two 48-inch mains, through which flows about one-half of the water used by the city, themselves form the arched ribs which support the roadway overhead. The span of this bridge is 200 feet and its rise 20 feet. At the time it was built it was the only one of its kind in the world, and, it is believed, is so [illegible] at the present day. It was much commented upon by European engineers, and was illustrated in many of the foreign scientific and engineering journals of the [illegible]



GARDINER GREENE HUBBARD

It is with the most profound regret that we record the death of Mr Gardiner G. Hubbard, which occurred at his country [illegible] Oaks, near Washington, on Saturday, December 11, [illegible] the [illegible] of the Scientific Societies of Washington [illegible] of many [illegible] and broad-minded presidents; the Smithsonian Institution [illegible] regents; the Columbian University [illegible] and [illegible] and other educational [illegible] and benevolent institutions of the nation [illegible] a liberal [illegible] and a wise counselor [illegible] the National Geographic Society and its work [illegible] created. The President of the Society from its foundation, Mr Hubbard was enabled by a [illegible] of circumstances as exceptional [illegible] was fortunate to [illegible] that is practically without a parallel. In the history of scientific societies [illegible] benefactions of

the wise counsel [illegible] judgment [illegible] for [illegible] of the [illegible] enterprise and the most progressive ideas. Rarely if ever before, however, have these qualities and functions been [illegible]

usefulness [illegible] given to Mr Hubbard and as he exercised to its fullest extent. The loss to the National Geographic Society is [illegible] and the ordinary expressions of regret seem cold and conventional.

It is impossible, in this number of the Magazine, to attempt [illegible] portrayal of Mr Hubbard's unique personality, or to do justice to the nobility of his character or [illegible] his [illegible] services to the Society. We can [illegible]

for the advancement of science, and [illegible] that a [illegible] and notice of his life and work will appear in the January number of this journal.

J. H.

POLLUTION OF THE POTOMAC RIVER.

By F. H. Newell,

Chief Hydrographer, U. S. Geological Survey.

The facts concerning the pollution of the Potomac river are of peculiar concern to the residents of Washington because of the fact that the supply for domestic and municipal use is derived mainly from that stream, only a small portion being ob- [illegible]

but opinions differ widely as to whether these pollutions are dangerous, or whether they may be sources of ever-present danger to the community.

In order to discuss this subject intelligently it is necessary to have clearly in mind the situation of the catchment basin of the river, as well as the relative position of the various tributaries and of the principal towns and industrial [illegible]. We of course [illegible]

midway of the eastern side of the United States. It rises in the Allegheny mountains, its drainage basin embracing portions of the states of Pennsylvania, Maryland, West Virginia, and Virginia. [illegible]

mountain ranges unite in creeks or rivers flowing rather northeast [illegible]

By far the greater portion of the tributaries flow toward the southeast, the streams coming from the northern part of the basin being relatively small. The main river itself, escaping from [illegible]

the mountains, having a southeasterly direction, although in detail its course is quite crooked.

[illegible]

as a source of power is not so valuable as might be expected from the size of its drainage area. At the points where the river

[illegible] the Northern rib [illegible] the west of Las Alas [illegible] the South branch to the west. The total drainage area of the New Mexico portion of Cimarron is 811 square miles, or about 5 per cent of the entire catchment area above the city of Winslow. The total drainage area of the North [illegible] is [illegible] square miles, or about [illegible] per cent of the entire catchment area above the city of Winslow.

[illegible] waters of the North [illegible] are naturally much harder, and [illegible] by the addition of the regulation of the reservoir it has always been necessary to the production of [illegible] water [illegible] forests. These [illegible] by the [illegible] from [illegible] suspended, however, and [illegible] the [illegible] near [illegible] the polluted water destroyed by the fall [illegible] and [illegible] [illegible] the main [illegible] [illegible] of [illegible] [illegible]

[illegible] to [illegible] a general [illegible] of [illegible] [illegible] of [illegible] [illegible] it is necessary to know how much water is carried by [illegible]. This, of course, varies from day to day as [illegible] by [illegible]. These [illegible] and [illegible] [illegible] and by talking [illegible] [illegible] [illegible] it will [illegible] be to know how much water [illegible] to deliver [illegible] also [illegible] streams and the [illegible] tributaries. Without [illegible] into a [illegible] of how this [illegible], it [illegible] be [illegible] [illegible] [illegible] [illegible] [illegible] using [illegible] daily [illegible] throughout the year [illegible] feet per second.

The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] by Mr. W. Hunt, U. S. [illegible], [illegible] per second [illegible] to be [illegible] during the past [illegible] [illegible] to the protected by [illegible], the [illegible] [illegible] to almost the [illegible]. At [illegible] time the water received into the [illegible] [illegible] estimated to have been from 75 to 100 second-feet, or from 7 to 9 per cent of the total [illegible] of the [illegible].

It is evident that [illegible] advantage of water in the [illegible] [illegible]

Where [illegible] [illegible] [illegible] to be [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] necessarily become less. The [illegible] of the [illegible]

[illegible] generally accepted test is to claim not more than one part of the water

[illegible] parts of bacteria per cubic centimeter, and [illegible]

[illegible] oxygen and evidence tending to its purification. Where

[illegible] contamination is such that the purity of the water

[illegible] should not be supposed for the city as a body as it should be.

[illegible] to find out all of accumulations [illegible]

[illegible] of this sort [illegible] to the river, and [illegible]

[illegible] to steadily increasing. It is not desirable to [illegible]

[illegible] characterize the material undergoing [illegible]

It may properly be claimed, however, that the matter [illegible]

[illegible] material in the river which [illegible] decomposition

[illegible] and [illegible] which [illegible] the Washington [illegible]

[illegible] There [illegible]

[illegible] there is no doubt that [illegible] the [illegible]

[illegible] of the [illegible]

The conditions along the tributaries are particularly favorable, for the water passes over many [illegible] where it is exposed

[illegible] while others may possess [illegible]

[illegible] characteristics to be [illegible], but [illegible] all of these

[illegible] are generally admitted, as it by common [illegible] such other and

[illegible] the [illegible] of bacteria [illegible] gradually [illegible]

[illegible] conditions [illegible] The [illegible] [illegible] of [illegible]

[illegible] however [illegible] the [illegible] [illegible]

Take, for example, the typhoid fever [illegible] [illegible]

[illegible] of the natural ways of the river to [illegible]

[illegible] in [illegible] hours. It may be

the journey of from two to four days or more for the sewers of towns up the river to the mouth of the tributaries.

We are comforted by the assurance that bacteria [illegible] are rarely found in Potomac water; but even this does not set the wholly at rest for negative evidence in such a case proves little. The [illegible] of the [illegible] diseases from sewage

THE DELTA OF THE MISSISSIPPI RIVER.*

By B. L. Gerhard, E. Sc., etc.

The Mississippi delta proper is a sector flat country lying to the

Many interesting facts bearing upon the question of the geological formation of the Mississippi delta were brought to attention two years ago through the investigations and discussions one [illegible]

executors of the late Mr James B. Eads and the War Department as to what is the legal plane of reference for ascertaining the depths and widths of channel which Mr Eads was required by the law of the General Congress to maintain between the deep water of the South Pass of the Mississippi river and the Gulf of M[illegible]

On Balize Bayou, which leads out to the Gulf from one of the now unused passes of the river was built a Spanish magazine. [illegible]

the mouth of the South Pass this magazine was in a fair state of preservation. The exterior was intact and there were no cracks [illegible]

level, but with the surface of the water stretching across the arch which covered the entrance door, the sill of which must have been at least [illegible] feet below the water. That was in the year 18[illegible] Nineteen years later a part of the structure had been removed but enough of the roof and arch remained to show that the subsidence had continued steadily during that period, and to have been at about the same rate as during the preceding two hundred years. It may be stated that the estimate from this instance and from other information, is, at the mouth of the Mississippi, about one-half of one-tenth of a foot per annum. No more [illegible] going to prove the general subsidence of [illegible] lands than is ought as stated. Not only are these lands unstable in a vertical direction, but they are often found to be so in a horizontal direction. It is an [illegible] engineering as well as physical fact that an accurately measured base line [illegible]

to be 71[illegible] feet in length. It has been found impracticable to [illegible] with sufficient accuracy for reference purposes bench-marks, level heights, and tide gauges. This subject is quite fully discussed in the Report of the Mississippi River Commission [illegible]

statement is made, "Discrepancies in bench-marks and levels, [illegible]

Pass unreliable." This remark is made by Mr J. A. Ockerson, assistant engineer to the commission.

On page 365 of the same report the circumstance in itself confirms Mr Ockerson's statement by its own explanation, as follows: "The main object of this resurvey was to obtain some information bearing upon the question of the stability of the land about the mouth of the river. In the report of Assistant Engineer Ockerson, appended to the report of the secretary, a number of figures and comparisons are given, based upon this survey and prior ones, and showing a progressive depression of the made land near the mouth of the river." An interesting diagram, designed to [illegible]

[illegible] had gone down or the level of the Gulf had gone up over one [illegible]

[illegible] forward to show, in addition to the above, that the lands had gone down and that the Gulf level had not changed. It is a fact well known to people living on the delta of the Mississippi [illegible]

[illegible] of overflow by Gulf waters, due to the sinking of the lands [illegible]

[illegible] to the construction of levees. There are at present no annual [illegible]

[illegible] of the river. These accretions formerly were a little more than equal to the annual subsidence of the region.

As to the question of the rising of the Gulf level, careful observations extending around the entire Gulf coast from Yucatan to Florida deny any indications of any such elevation. The [illegible]

[illegible] crate so steadily from year to year and from cycle to cycle that we should naturally expect that, with the exception of small [illegible] [illegible] due to wind and tides, the mean surface of the Gulf would remain practically at the same level. Local diurnal [illegible]

[illegible] very slight as compared with the great current forces that make and maintain the Gulf level. From considerations [illegible] it may be stated that the mean precipitation, river discharge, and evaporation are not all to be balanced over these conditions [illegible] percentage. This volume makes an utter insignificance when [illegible]

[illegible] that channel, which, according to a conclusion from the statement [illegible]

[illegible]

[illegible] the Gulf.[*]

* [illegible] Monthly [illegible] Review, [illegible] No. [illegible], February [illegible]

The geology of the delta of the Mississippi is an interesting [illegible] the great areas of the delta of the [illegible] of sedimentary deposits, and the steady, though slow, subsidence of those areas, is one which should be taken into account in devel- [illegible] waters entirely from the great areas of the lower delta country, far outweighs the disadvantages to future generations from the subsidence of the local delta lands below the level of the sea and [illegible] schools, yet it is safe to say that the development of the delta [illegible] system, at whatever cost to the riparian States and the Federal Government, will be so remarkable that people of the whole United States can well afford, when the time comes, to build a protective levee against the Gulf waters, as the city of New Orleans has done on a small scale against the sea waters of Lake Pontchartrain, and as Holland has done for centuries and is now about to accomplish on a larger scale in removing the sea waters themselves in the great projected reclamation of the lands submerged by the Zuyder Zee. Mr. [illegible] once said [illegible] and its delta [illegible] to the sea: "This great stream, with its [illegible] curious network, and [illegible] and the [illegible] lands so fertile that human ingenuity is overtaxed to arrest their productiveness, [illegible] of this republic."

THE ANNEXATION FEVER

A curious and interesting example of the survival of [illegible] [illegible] ized, in greater or less degree.

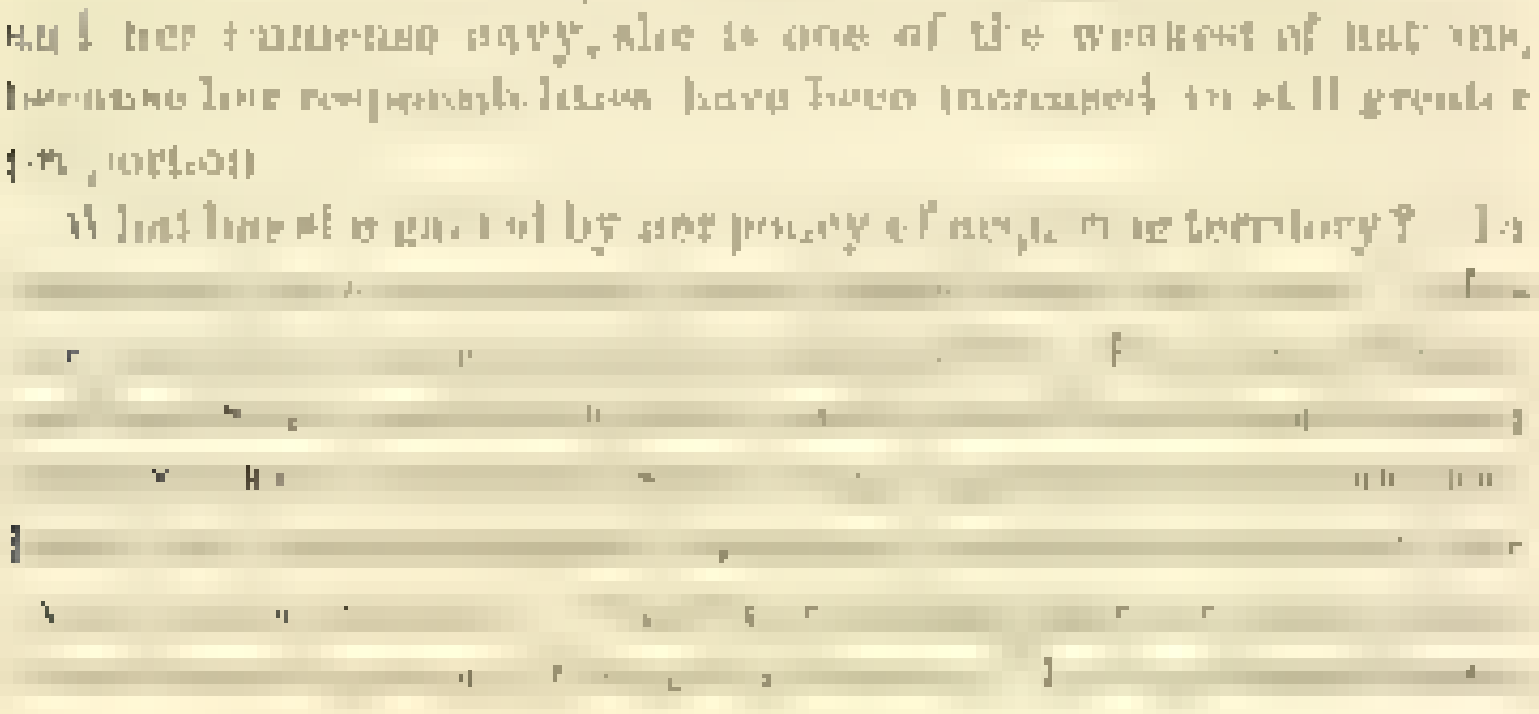
In the olden time, when the earth was peopled by savages, the acquisition of territory by conquest involved not alone the

Viewed critically, our annexations of territory up to a [illegible] [illegible] sight of our statesmen. We needed Louisiana to control the [illegible] [illegible], removed Spanish power from our midst, and gave us the entire Atlantic and Gulf coasts; the annexation of Texas [illegible] [illegible] up our area of jurisdiction into compact form. But why we should have purchased Alaska is past finding out. A few of our citizens have profited by the fur and fish trade, but the government has been embarrassed and put to much expense on [illegible] [illegible] are certain in the future.

[illegible] made up of our own kin, the vast body of the population [illegible] [illegible] addition to our numbers. The [illegible] [illegible] [illegible] our vessels can coal there freely in time of peace. In time of war our vessels will find occupation enough at home without wandering away from the coast [illegible] We [illegible] power, especially a naval power. It is certain that in case of war with such a power one of our first acts would be to give up all such outlying dependencies, since their defense would be utterly impracticable.

There is no [illegible], however, to the Hawaiian matter [illegible] [illegible] the ruling class in Hawaii would be better [illegible] have reached this stage of altruism.

What has been written of Hawaii applies with much greater [illegible]



alone are found not less than [illegible] of persons of [illegible]
descent. Vastly more of her people have gone to the United
States than to her colonies.
[illegible]
[illegible]
she has been, on the whole, one of the greatest agencies for good,
by the spread of civilization, that the world has known.
[illegible]

SIR JOHN EVANS AND PROF. W J McGEE

Whether one of the ultimate results of that [illegible] tendency
[illegible]
gation which constitutes so striking a characteristic of the present
age will be to render it impossible for a man to become
eminent in more than one department of intellectual activity
[illegible]
[illegible]
tion for the Advancement of Science having this year been
[illegible]
in more than one department of science.

By occupation a civil engineer and paper manufacturer, and
highly successful in both capacities, Sir John Evans has made
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
trious by the names of Horsford and Brewster, of Lyell and
Murchison, of Huxley and Tyndall, he has only one more
scientific distinction to look forward to—the presidency of the
Royal Society.

Thirty years the junior of his eminent English compeer, Prof.
W J McGee [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
wonder and envy of all [illegible] that one [illegible] a decade to

[illegible] part of the State of New York He established the [illegible] other sequences throughout southeastern United States, the [illegible] of over eighty separate units In this latter work as [illegible] in charge of the Bureau of American Ethnology he has made [illegible] the aboriginal races of the North American continent, and the [illegible] reports and his numerous contributions to the transactions of [illegible] societies. No worthier representative of American science could have been found to preside over the American Association during the year of the visit of the British Association to this continent than Prof W J McGee J. L.

SOME RECENT GEOGRAPHIC EVENTS

[illegible] considerable geographical interest have on the whole served to [illegible] a brief notice of them, if only as a matter of record

[illegible] of Dr Sven Hedin from Central Asia The successful ascent of Mount St Elias by Prince Luigi of Savoy, and the Museum Expedition [illegible] death of Professor Fergus Moltheu

Here A. Andree, accompanied by Dr Strindberg and the engineer [illegible] expected [illegible] penetrate the [illegible] Siberian [illegible]

been taken. The *Belgica* will go first to the east of Graham

... year will be devoted to Victoria Land. The steamer is well

and submarine deposits.

... which left England on July 11, 1894, in the steam yacht *Windward*, arrived in the Thames on the 3d of September last.

... determined the northern coast line of Franz Josef Land, hitherto absolutely unknown, but proved, if not the non-existence of ... Land, at least the fact that it does not lie in the longitude that has been assigned it. The three years spent in the Polar

... which was borne by Mr. Alfred Harmsworth, who has since placed the *Windward* at the service of Lieutenant Peary) have resulted

Arctic geography, but to various other sciences.

Lieutenant Peary's most recent expedition to Greenland is of ... chiefly on account of the success that has attended his efforts to bring back with him the Cape York meteorite, 45 to ...

... most eminent authorities leaves no room for doubt as to its extra-terrestrial origin.

The return of Dr. Sven Hedin from his four years' exploration

Dr. Hedin left Stockholm in October, 1893, returning to that city, ... May 10 last. He made many important discoveries, among which were two ancient cities, now buried in the sands, whose paintings and sculptures bear witness to a high de-

and Norway and a few private individuals.

The Duke of the Abruzzi (Prince Luigi of Savoy) and his com-

on July 31. It took 38 days of hard traveling to reach the foot of the mountain from the point of debarkation, but the actual

GEOGRAPHIC LITERATURE

[illegible]

Japan, the Garden of the East. By Elisa Scidmore, Author of "Java, the Garden of the East." With 60 Illustrations. New York: The Century Company. 1895. 8vo.

[illegible]

[illegible] and Prof. W. M. Davis, October 25, 1897.—Secretary Abbot announced the death of Dr. Charles Hodge by accidental drowning in the Arctic Ocean, August 2nd. After introductory remarks by President Hubbard, short addresses were delivered by Mr. W. J. McGee on the [illegible] Bureau of Indian Affairs. A paper prepared by Capt. H. L. Marshall, U. S. Corps of Engineers, on Canadian Bridge and Waterway [illegible]

Cabin John Aqueduct was then read by Mr E. B. Lee, and the meeting adjourned to inspect the bridge and explore the surrounding country.

Special Meeting, October 22, 1897.—President Hubbard in the chair. Afternoon lecture by Prince Kropotkin on Russia and Siberia.

Reception to Dr Nansen, October 28, 1897.—Evening reception to Dr Fridtjof Nansen by the National Geographic Society at the Arlington hotel. President Hubbard, with the officers of the honorary reception committee, received the guests and presented them to Dr Nansen. About 1,000 persons were present. Later the President made a short address of welcome, and after remarks by Vice-President Greely and Engineer-in-Chief Melville, U. S. N., Dr Nansen addressed the Society, expressing his cordial appreciation of the hearty welcome he had received and his indebtedness to American explorers, especially those of the *Jeannette* expedition, for the idea of his own voyage in the *Fram*.

Special Meeting, October 29, 1897.—Mr W J McGee in the chair. Vice-President Greely addressed the Society on Recent Geographic Progress.

Regular Meeting, November 5, 1897.—Vice-President Gilbert in the chair. Mr Robert T. Hill gave an illustrated lecture on the Geography of Jamaica and its Bearing on its Industrial Development.

Excursion and Field Meeting, November 6, 1897.—Saturday afternoon excursion to High Island by electric cars for [illegible], whence the party, consisting of about 200 members and guests, walked to the northern end of the island. The field meeting was called to order by Mr Stevens, and Mr Frederick V. Coville delivered a short address on the Coloration and Fall of Autumn Leaves. Later, at a meeting on the east side of the island, Mr Coville spoke of Adaptations for the Natural Distribution of Seeds, with practical illustrations.

ELECTIONS.—New members have been elected as follows:

September 16.—Lieut. Chas. P. Echols, U. S. A., Miss Grace G. Jenness, R. R. Robinson.

October 6.—Mrs Mary D. Agnew, Rev. C. M. Bird, Major H. G. Burton, Mrs John P. Buckwalter, H. M. Brayton, E. A. Conner, Jos. Dugue, Miss Ellen C. Dyer, L. O. Garrett, Mrs Thos. Hoggman, Edwin A. Hill, Mrs Sara Haggenberger, Edgar Jadwin, M.D., Miss Virginia Kenney, Mrs J. B. Kendall, Henry Kroestad, M.D., Capt. F. Macbeth, U.S.A., W. F. Nailey, Miss Louisa G. Nash, Wilfred H. Osgood, Miss Mary R. O'Toole, A. Patton, M.D., Miss Cl. Augusta Pope, Hon. L. A. Pratt, G. W. Prewitt, M.D., J. W. Romer, Wm. J. Rowe, Chief Engineer C. R. Roelker, U.S.N., Jared G. Smith, Dr G. L. Spencer, O. H. Tittmann, Miss Mary E. C. Walker, Miss Helen L. Walsh, Edwd. C. Wilson, Miss Laura E. Woodland, Miss Isabel L. Wright.

October 27.—Miss Amelia B. Adam, Miss Jennie P. Andrews, Dr Frank Baker, E. L. J. Bertschey, Henry T. Baker, Eugene Byrnes, Miss Kate Carne, Robert S. Chilton, Thos. H. Clark, Major C. E. Dyer, Saml. F. Emmons, W. J. Elston, M.D., C. G. Ireland, Miss Etta Goulding, F. P. Hackney, Mrs Wm. Hayden, Archibald Hopkins, F. M. Hosler, Dr L. O.

Chargé d'Affaires, &c. &c., Legation of Sweden and Norway. Com. A.

[illegible] Bacon, U.S.N., Miss M. E. Barton, Miss N. E. S. Bellows, Geo.

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GEOGRAPHIC NOTES

Europe

Lighthouse Returns.—The report of the lighthouse service of Great Britain shows that the service consisted at the year ending March 31, 1897, of 4,253 stations and lights. The cost of the service was £317,713.

Iceland.—The Althing or local parliament, has resolved to grant an annual subsidy of $6,000 for 20 years to any company which has undertaken to lay a submarine cable from Iceland to Scotland via the Faroe Islands. The Danish government also has promised financial aid, and it is expected that the cable will be laid next summer.

GERMANY.—The German production of [illegible] is estimated at 8,000,000 tons. The imports have risen from 2,400,000 tons in 1871 to 4,200,000 tons in 1891, but according to Mr T. E. Moore, United States commercial agent at Weimar, there is not the slightest [illegible] the stringent forest regulations which have so long been in force. Mr Moore adds that at the rate at which the devastation of forests is now going on in Russia, Sweden, and Austria, those countries will soon have the same experience as Spain, which has been robbed of a part of her natural riches by the short-sighted policy of past generations.

ASIA.

KOREA.—Korea is becoming to a large extent the [illegible] of Japan and Japanese manufacturers are crowding the products of other countries out of the Korean market simply by [illegible] of their cheapness.

HONG-KONG.—The total tonnage entering and leaving the port of Hong-Kong in 1896 amounted to [illegible] million tons. Of this about 7½ million tons represented the tonnage of junks and river steamers, leaving about [illegible] million tons engaged in foreign trade, of which more than one-half was [illegible]

[illegible] railway communication has now been established between [illegible] and Vladivostok, and the line will be opened for traffic at [illegible]. The Russian government has purchased ten tons of cheese [illegible] the Siberian farmers.

NORTH AMERICA.

CANADA.—The mineral output of British Columbia in 1896 amounted to $7,146,425, as compared with a total of $2,608,803 in 1895.

MEXICO.—The Mexican government has officially promulgated a concession for a railroad from Chihuahua to the Pacific coast. The length of the line will be 372 miles, and [illegible] construction the government agrees to pay the promoters a subsidy of $4,000,000. It has also granted a concession, without subsidy, for the construction of a railroad from Presidio del Norte, on the Rio Grande, state of Chihuahua, west, via Chihuahua city, to a point on the Pacific coast in the state of Sinaloa. U. S. Consul R. M. Burke states that the mineral wealth of the region through which these railroads must pass is very considerable.

AUSTRALASIA.

The Australasian gold yield during 1896 amounted to 2,37[illegible]48 ounces, an increase of 10,7[illegible] ounces on the preceding year.

The forests of the colony of Western Australia cover an estimated area of 20,400,000 acres and contain marketable timber to the value of £171,000,000.

[illegible] 1898, when Queensland will be represented.

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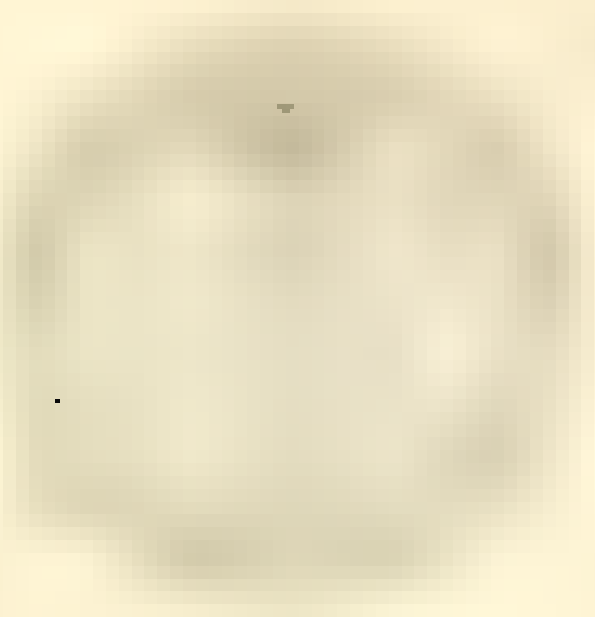

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VOL. VIII—YEAR 1897

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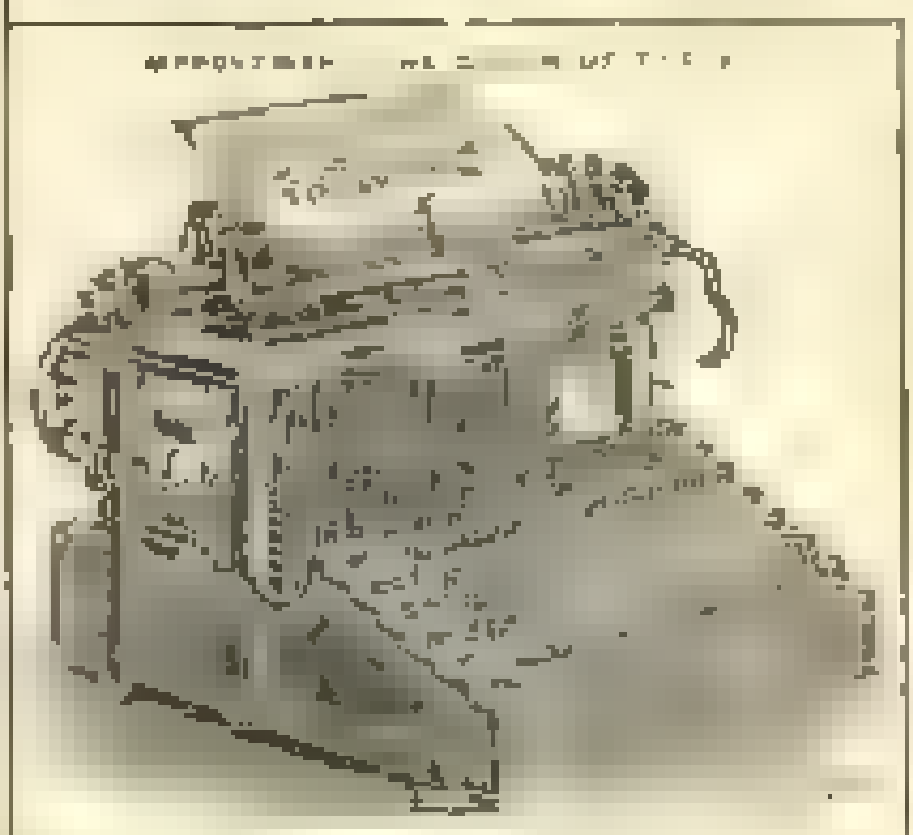

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